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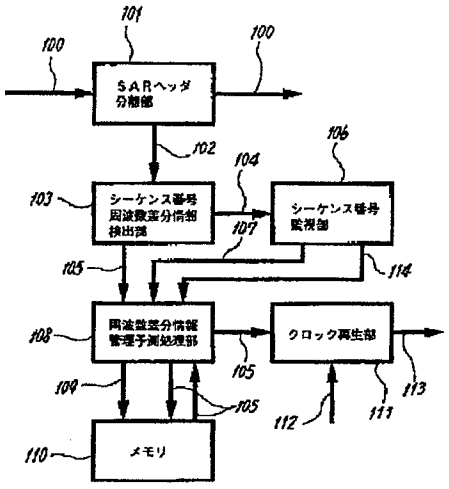
(54) METHOD AND CIRCUIT FOR CLOCK RECOVERY

(57) Abstract:

PURPOSE: To stably recover a source clock even when cell abort takes place in an ATM system by using N-th period frequency difference information whose reception is disable due to cell abort having been already accurately received before M-th period frequency difference information so as to obtain the M-th period frequency difference information.

CONSTITUTION: On the occurrence of abort of a cell on which M-th period frequency difference information is multiplexed, a sequence number monitor section 106 detects cell abort and provides an output of a signal 107 to a frequency difference information management prediction processing section 108. The processing section 108 uses N-th period frequency difference information stored in a memory 110 before the M-th period information and received accurately to obtain a predicted value of the M-th period frequency difference information through arithmetic operation and gives the predicted value to a clock recovery section 111. The recovery section 111 recovers a source clock 113 by using the predicted value of the frequency difference information.



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CLAIMS

[Claim(s)]
[Claim 1]In the transmitting side with asynchronous network clock and source clock, Difference information of frequency of said network clock and a source clock is detected at intervals of a constant period, It is a transmission system which transmits a cell which multiplexed sauce which has an information field header based on this delta-frequency minute information and a sequence number of a generated number series corresponding for every cell, Said sequence number included in said information field header separated from said cell received by a receiver and said delta-frequency minute information are detected, M (M is natural number) cycle which detected abandonment of said cell with the continuity of said sequence number, and was missing by abandonment of said cell -- impending -- account delta-frequency minute information, N (N is natural number) cycle correctly received before said M cycle eye -- impending -- a clock reproduction method which predicts based on account delta-frequency minute information, and reproduces said source clock based on delta-frequency minute information by said prediction.
[Claim 2]In the transmitting side with asynchronous network clock and source clock, Difference information of frequency of said network clock and a source clock is detected at intervals of a constant period, It is a transmission system which transmits a cell which multiplexed sauce which has an information field header based on this delta-frequency minute information and a sequence number of a generated number series corresponding for every cell, An information field header separation part which separates said information field header from said received cell, A sequence number delta-frequency minute information primary detecting element which detects said sequence number and said delta-frequency minute information from said separated information field header, The sequence number Monitoring Department which supervises said detected sequence number and detects abandonment of said cell based on the continuity of said sequence number, M (M is natural number) cycle received at intervals of the constant period -- impending -- N (N is natural number) cycle received before account delta-frequency minute information and M cycle eye -- impending -- with a memory which records account delta-frequency minute information. A delta-frequency part information management forecast processing part which manages said delta-frequency minute information in said memory, and calculates a predicted value of said delta-frequency minute information based on a monitored result of said sequence number Monitoring Department, It has a clock reproduction part which reproduces said source clock based on said delta-frequency minute information outputted from said delta-frequency part information management forecast processing part, and said network clock, As opposed to abandonment of said cell as which said sequence number Monitoring Department detected said delta-frequency part information management forecast processing part, M (M is natural number) cycle missing by abandonment of said cell -- impending -- N (N is natural number) cycle which received correctly a predicted value of account delta-frequency minute information before said M cycle eye -- impending -- a clock reproduction circuit constituted so that it might calculate based on account delta-frequency minute information.
[Claim 3]A difference calculation circuit which calculates a difference value of delta-frequency

minute information included in a cell of L (L is natural number) cycle eye correctly received to a delta-frequency part information management forecast processing part, and delta-frequency minute information included in a cell of a periodic (L+1) eye received correctly, A period counter which calculates periodicity of delta-frequency minute information based on a periodic signal according to an outputted delta-frequency minute information periodic signal from the sequence number Monitoring Department, A latch holding periodicity of delta-frequency minute information of N cycle eye which was calculated by said period counter and which was received correctly, Based on a sequence number according to a sequence number monitored result signal outputted from said sequence number Monitoring Department, with a cycle difference arithmetic circuit which calculates a cycle difference value of periodicity of said N cycle eye held at said latch, and periodicity of delta-frequency minute information of missing M cycle eye. A multiplication circuit which performs multiplication of said difference value calculated by said difference calculation circuit and said cycle difference value which was able to be calculated by said cycle difference arithmetic circuit, Have a subtractor circuit which subtracts a multiplication result of said multiplication circuit from a value of delta-frequency minute information of said N cycle eye received correctly, and said delta-frequency part information management forecast processing part, M cycle which was missing in a subtraction result which said subtractor circuit outputs -- impending -- the clock reproduction circuit according to claim 2 constituted so that it might be considered as a predicted value of account delta-frequency minute information.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the clock reproduction method of a transmission system and clock reproduction circuit which cell-ize information and transmit it.
[0002]
[Description of the Prior Art]The conventional clock reproduction circuit is explained below, referring to drawings. Drawing 4 shows the block diagram of the conventional clock reproduction circuit. The ATM (Asynchronous Transfer Mode) transmission system in which abandonment of a cell generates 400 in drawing 4, The SAR header separation part which separates the SAR (Segmentation And Reassemblysublayer) header which is an information field header of the cell which 401 received from the ATM transmission system 400, The SAR header which separated 402 by the SAR header separation part 401, the delta-frequency minute information primary detecting element where 403 detects delta-frequency minute information from the SAR header 402, The delta-frequency minute information which 404 detected, and 405 are clock reproduction parts which reproduce the source clock 407 with the detected delta-frequency minute information 404 and the network clock 406.
[0003]In [drawing 3 shows the format of the cell transmitted in the ATM transmission system 400, and] the transmitting side, The difference information of the frequency of a network clock and the frequency of a source clock is detected at intervals of a constant period, and multiplex [of the detected delta-frequency minute information and the sequence number which is the generated number series corresponding for every cell] is carried out for every cell as an SAR header.
[0004]In the conventional clock reproduction circuit constituted as shown in drawing 4, The SAR header of the cell received through the ATM transmission system 400 is separated by the SAR header separation part 401, The separated SAR header 402 is inputted into the delta-frequency minute information primary detecting element 403, the delta-frequency minute information 404 received at intervals of a constant period is detected, and the source clock 407 is reproduced in the clock reproduction part 405 with the delta-frequency minute information 404 and the network clock 406 which were detected.
[0005]
[Problem(s) to be Solved by the Invention]However, in the above conventional clock reproduction circuits. When cell abolition occurs in the ATM transmission system 400, By this cell abolition, lack of the delta-frequency minute information multiplexed in the cell as an SAR header occurs, It becomes impossible to have received delta-frequency minute information required for reproduction of a source clock at intervals of the constant period, and in this case, it becomes impossible to have reproduced the source clock and had the problem that it became difficult for it to be stabilized and to reproduce a source clock.
[0006]Even when this invention cancels the above-mentioned conventional problem and cell

abolition occurs in an ATM transmission system, Influencing of influence in reproduction of the source clock by this cell abolition can be controlled, and it aims at providing the clock reproduction method which is stabilized and can reproduce a source clock, and a clock reproduction circuit.
[0007]
[Means for Solving the Problem]To achieve the above objects, a clock reproduction method according to claim 1, In the transmitting side with asynchronous network clock and source clock, Difference information of frequency of said network clock and a source clock is detected at intervals of a constant period, It is a transmission system which transmits a cell which multiplexed sauce which has an information field header based on this delta-frequency minute information and a sequence number of a generated number series corresponding for every cell, Said sequence number included in said information field header separated from said cell received by a receiver and said delta-frequency minute information are detected, M (M is natural number) cycle which detected abandonment of said cell with the continuity of said sequence number, and was missing by abandonment of said cell -- impending -- account delta-frequency minute information, N (N is natural number) cycle correctly received before said M cycle eye -- impending -- it predicts based on account delta-frequency minute information, and is considered as a method of reproducing said source clock based on delta-frequency minute information by said prediction.
[0008]To achieve the above objects the clock reproduction circuit according to claim 2, In the transmitting side with asynchronous network clock and source clock, Difference information of frequency of said network clock and a source clock is detected at intervals of a constant period, It is a transmission system which transmits a cell which multiplexed sauce which has an information field header based on this delta-frequency minute information and a sequence number of a generated number series corresponding for every cell, An information field header separation part which separates said information field header from said received cell, A sequence number delta-frequency minute information primary detecting element which detects said sequence number and said delta-frequency minute information from said separated information field header, The sequence number Monitoring Department which supervises said detected sequence number and detects abandonment of said cell based on the continuity of said sequence number, M (M is natural number) cycle received at intervals of the constant period -- impending -- N (N is natural number) cycle received before account delta-frequency minute information and M cycle eye -- impending -- said delta-frequency minute information in said memory based on a memory which records account delta-frequency minute information, and a monitored result of said sequence number Monitoring Department, [manage and] A delta-frequency part information management forecast processing part which calculates a predicted value of said delta-frequency minute information, It has a clock reproduction part which reproduces said source clock based on said delta-frequency minute information outputted from said delta-frequency part information management forecast processing part, and said network clock, As opposed to abandonment of said cell as which said sequence number Monitoring Department detected said delta-frequency part information management forecast processing part, M (M is natural number) cycle missing by abandonment of said cell -- impending -- N (N is natural number) cycle which received correctly a predicted value of account delta-frequency minute information before said M cycle eye -- impending -- it constitutes so that it may calculate based on account delta-frequency minute information.
[0009]
[Function]the delta-frequency minute information of N cycle eye already correctly received before M cycle eye by cell abolition instead of the delta-frequency minute information of M cycle eye which was receive-not-ready ability according to the method of claim 1, and the composition of claim 2, [use and] The predicted value of the delta-frequency minute information of M cycle eye is calculated, and a source clock is reproduced with the calculated delta-frequency minute information predicted value.
[0010]

[Example]Hereafter, the clock reproduction method of one example of this invention and the clock reproduction circuit for realizing this are explained, referring to drawings.
[0011]Drawing 1 is a block diagram of the clock reproduction circuit of this example. The ATM (Asynchronous Transfer Mode) transmission system in which abandonment of a cell generates 100 in drawing 1, The SAR header separation part as an information field header separation part which separates the SAR (SegmentationAnd Reassembly sublayer) header which is an information field header of the cell which 101 received from the ATM transmission system 100, The sequence number delta-frequency minute information primary detecting element which detects the sequence number 104 and the delta-frequency minute information 105 from the SAR header which 102 separated by the SAR header separation part 101, and the SAR header 102 which 103 separated, The sequence number Monitoring Department where 106 supervises the sequence number 104, and 107 The sequence number monitored result signal of the sequence number 104 in the sequence number Monitoring Department 106, 114 the delta-frequency minute information detected at the sequence number Monitoring Department 106 by the constant period signal to receive a delta-frequency minute information periodic signal and 108, The delta-frequency part information management forecast processing part which manages the delta-frequency minute information 105 with the sequence number monitored result signal 107, and carries out data processing of the delta-frequency minute information predicted value by the delta-frequency minute information 105, the memory which 110 records the delta-frequency minute information of M cycle eye, and the delta-frequency minute information of N cycle eye before M cycle eye with the delta-frequency part information management signal 109 outputted from the delta-frequency part information management forecast processing part 108, and is held. 111 is a clock reproduction part which reproduces the source clock 113 with the delta-frequency minute information 105 and the network clock 112.
[0012]Clock reproduction operation of the clock reproduction circuit which consists of the above components is explained below using a drawing. In drawing 1, a cell is first transmitted by the ATM transmission system 100. The SAR header 102 is separated from the received cell by the SAR header separation part 101. The SAR header 102 separated by the SAR header separation part 101 is constituted from sequence number protection which protects a sequence number, delta-frequency minute information, a sequence number, and delta-frequency minute information by the format as shown in drawing 3. A sequence number is the number series added to a chronological order of the cell in the transmitting side. The sequence number delta-frequency minute information primary detecting element 103 detects the sequence number 104 and the delta-frequency minute information 105 from the SAR header 102 separated by the SAR header separation part 101. The detected sequence number 104 is supervised by the sequence number Monitoring Department 106. The discontinuity of a sequence number detects cell abolition. The sequence number Monitoring Department 106 outputs the existence of cell abolition as the sequence number monitored result signal 107. The delta-frequency part information management forecast processing part 108 manages the received delta-frequency minute information 105 with the sequence number monitored result signal 107.
[0013]When it is usual [which cell abolition or cell delay does not generate] here, By the delta-frequency part information management forecast processing part 108, the received delta-frequency minute information 105 is recorded instead of the oldest delta-frequency minute information currently recorded on the memory 110, and the delta-frequency minute information of M cycle eye and the delta-frequency minute information of a periodic (M-1) eye are recorded on the memory 110.
[0014]When abandonment of the cell which carried out multiplex [of the delta-frequency minute information of M cycle eye] occurs, The sequence number Monitoring Department 106 outputs the sequence number monitored result signal 107 which detected generating of cell abolition to the delta-frequency part information management forecast processing part 108, The delta-frequency

part information management forecast processing part 108 calculates the predicted value of the delta-frequency minute information of M cycle eye by data processing using the delta-frequency minute information of N cycle eye received correctly before M cycle eye currently recorded on the memory 110, The calculated delta-frequency minute information predicted value is outputted to the clock reproduction part 111, and the source clock 113 is reproduced using a delta-frequency minute information predicted value in the clock reproduction part 111.

[0015]Even when cell abolition occurs in the ATM transmission system 100 by the above operation, influencing of influence in reproduction of the source clock 113 by this cell abolition can be controlled, it is stabilized and the source clock 113 can be reproduced.

[0016]Next, it explains, referring to drawings for one example of the forecast processing part in the delta-frequency part information management forecast processing part (for example, delta-frequency part information management forecast processing part 108 of the clock reproduction circuit of this example shown in drawing 1) of the clock reproduction circuit of this invention.

[0017]Drawing 2 is a block diagram of the example of the forecast processing part in a delta-frequency part information management forecast processing part (for example, delta-frequency part information management forecast processing part 108 of drawing 1). The difference calculation circuit where 200 carries out data processing of the difference value 203 of the delta-frequency minute information of the delta-frequency minute information 201 of L (L is natural number) cycle eye and the delta-frequency minute information 202 of a periodic (L+1) eye which were recorded on the memory 110 in drawing 2, The period counter in which 204 calculates the periodicity 205 of delta-frequency minute information with the delta-frequency minute information periodic signal 114, and 206, When the sequence number monitored result signal 107 receives delta-frequency minute information normally, The latch holding the periodicity 207 of N cycle eye of the periodicity 205 of delta-frequency minute information and 208, [that is,] When cell abolition occurs with the sequence number monitored result signal 107, the cycle difference arithmetic circuit which calculates the cycle difference value 209 to the cycle which cell abolition generated after receiving delta-frequency minute information normally, and 2a are the prediction arithmetic circuits which comprised the multiplication circuit 210 and the subtractor circuit 215.

data processing of the predicted value 212 of the delta-frequency minute information of missing M cycle eye is carried out using the difference value 203 of delta-frequency minute information, the delta-frequency minute information 211 of N cycle eye received normally, and the cycle difference value 209.

The delta-frequency minute information 214 which received the delta-frequency minute information 105 which outputs 213 to the clock reproduction circuit 111 with the sequence number monitored result signal 107 when a cell was received normally, When cell abolition occurs, it is a selector circuit which is chosen from the delta-frequency minute information predicted value predicted in the prediction arithmetic circuit 2a, and is outputted.

[0018]Prediction processing operation of the forecast processing part which consists of the above components is explained below using figures. In drawing 2, when delta-frequency minute information is received normally, the delta-frequency minute information 201 of L cycle eye and the delta-frequency minute information 202 of a periodic (L+1) eye are used, Data processing of the difference value 203 of the delta-frequency minute information of the delta-frequency minute information 201 of L cycle eye and the delta-frequency minute information 202 of a periodic (L+1) eye is always carried out by the difference calculation circuit 200. If fluctuation of the source clock of the transmitting side is small, this difference value 203 will turn into about 1 constant value. The delta-frequency minute information periodic signal 114 is calculated by the period counter 204, and it asks for the delta-frequency minute information periodicity 205. When delta-frequency minute information is received normally, the delta-frequency minute information periodicity 205 is held by the latch 206 using the sequence number monitored result signal 107.

[0019]As for the periodic signal 205, M cycle is shown, when it was normally received to the delta-

frequency minute information of N cycle eye, and cell abolition is detected at the sequence number Monitoring Department 106 while receiving the delta-frequency minute information of M cycle eye. The periodicity 207 which received normally [the newest] shows N cycle.
The cycle difference arithmetic circuit 208 carries out data processing of the cycle difference of the periodicity 207 when delta-frequency minute information is normally received with the sequence number monitored result signal 107 and the present periodicity signal 205, and outputs the cycle difference value 209. The multiplication circuit 210 performs the multiplication of the difference value 203 of delta-frequency minute information, and the cycle difference value 209, and outputs the multiplication result 216. the subtractor circuit 215 subtracts the delta-frequency minute information 211 of N cycle eye to the multiplication result 216, and outputs this subtraction result to the clock reproduction circuit 111 via the selector circuit 213 as the predicted value 212 of the delta-frequency minute information of M cycle eye missing by cell abolition.
[0020]By being able to predict the delta-frequency minute information of M cycle eye missing by cell abolition, and outputting this delta-frequency minute information predicted value to the clock reproduction circuit 111 by the above operation, Based on this delta-frequency minute information predicted value, the clock reproduction circuit 111 can reproduce a source clock, and the effect explained in the example of drawing 1 can be acquired.
[0021]Although each of above-mentioned examples explained the ATM transmission system as an example, A network clock and the source clock of this invention are asynchronous not only at an ATM transmission system but the transmitting side, It cannot be overemphasized in other transmission systems which detect the difference information of the frequency of a network clock, and the frequency of a source clock, and transmit delta-frequency minute information at intervals of a constant period that it can apply similarly.
[0022]
[Effect of the Invention]the delta-frequency minute information of N cycle eye already correctly received before M cycle eye by cell abolition instead of the delta-frequency minute information of M cycle eye which was receive-not-ready ability as mentioned above according to this invention, [use and] The predicted value of the delta-frequency minute information of M cycle eye can be calculated, and a source clock can be reproduced with the calculated delta-frequency minute information predicted value.
[0023]Therefore, even when cell abolition occurs in a transmission system, influencing of influence in reproduction of the source clock by this cell abolition can be controlled, it is stabilized and a source clock can be reproduced.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application]This invention relates to the clock reproduction method of a transmission system and clock reproduction circuit which cell-ize information and transmit it.

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PRIOR ART

[Description of the Prior Art]The conventional clock reproduction circuit is explained below, referring to drawings. Drawing 4 shows the block diagram of the conventional clock reproduction circuit. The ATM (Asynchronous Transfer Mode) transmission system in which abandonment of a cell generates 400 in drawing 4, The SAR header separation part which separates the SAR (Segmentation And Reassembly sublayer) header which is an information field header of the cell which 401 received from the ATM transmission system 400, The SAR header which separated 402 by the SAR header separation part 401, the delta-frequency minute information primary detecting element where 403 detects delta-frequency minute information from the SAR header 402, The delta-frequency minute information which 404 detected, and 405 are clock reproduction parts which reproduce the source clock 407 with the detected delta-frequency minute information 404 and the network clock 406.
[0003]In [drawing 3 shows the format of the cell transmitted in the ATM transmission system 400, and] the transmitting side, The difference information of the frequency of a network clock and the frequency of a source clock is detected at intervals of a constant period, and multiplex [of the detected delta-frequency minute information and the sequence number which is the generated number series corresponding for every cell] is carried out for every cell as an SAR header.
[0004]In the conventional clock reproduction circuit constituted as shown in drawing 4, The SAR header of the cell received through the ATM transmission system 400 is separated by the SAR header separation part 401, The separated SAR header 402 is inputted into the delta-frequency minute information primary detecting element 403, the delta-frequency minute information 404 received at intervals of a constant period is detected, and the source clock 407 is reproduced in the clock reproduction part 405 with the delta-frequency minute information 404 and the network clock 406 which were detected.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]the delta-frequency minute information of N cycle eye already correctly received before M cycle eye by cell abolition instead of the delta-frequency minute information of M cycle eye which was receive-not-ready ability as mentioned above according to this invention, [use and] The predicted value of the delta-frequency minute information of M cycle eye can be calculated, and a source clock can be reproduced with the calculated delta-frequency minute information predicted value.
[0023]Therefore, even when cell abolition occurs in a transmission system, influencing of influence in reproduction of the source clock by this cell abolition can be controlled, it is stabilized and a source clock can be reproduced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the above conventional clock reproduction circuits. When cell abolition occurs in the ATM transmission system 400, By this cell abolition, lack of the delta-frequency minute information multiplexed in the cell as an SAR header occurs, It becomes impossible to have received delta-frequency minute information required for reproduction of a source clock at intervals of the constant period, and in this case, it becomes impossible to have reproduced the source clock and had the problem that it became difficult for it to be stabilized and to reproduce a source clock.
[0006]Even when this invention cancels the above-mentioned conventional problem and cell abolition occurs in an ATM transmission system, Influencing of influence in reproduction of the source clock by this cell abolition can be controlled, and it aims at providing the clock reproduction method which is stabilized and can reproduce a source clock, and a clock reproduction circuit.

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MEANS

[Means for Solving the Problem]To achieve the above objects, a clock reproduction method according to claim 1, In the transmitting side with asynchronous network clock and source clock, Difference information of frequency of said network clock and a source clock is detected at intervals of a constant period, It is a transmission system which transmits a cell which multiplexed sauce which has an information field header based on this delta-frequency minute information and a sequence number of a generated number series corresponding for every cell, Said sequence number included in said information field header separated from said cell received by a receiver and said delta-frequency minute information are detected, M (M is natural number) cycle which detected abandonment of said cell with the continuity of said sequence number, and was missing by abandonment of said cell -- impending -- account delta-frequency minute information, N (N is natural number) cycle correctly received before said M cycle eye -- impending -- it predicts based on account delta-frequency minute information, and is considered as a method of reproducing said source clock based on delta-frequency minute information by said prediction.
[0008]To achieve the above objects the clock reproduction circuit according to claim 2, In the transmitting side with asynchronous network clock and source clock, Difference information of frequency of said network clock and a source clock is detected at intervals of a constant period, It is a transmission system which transmits a cell which multiplexed sauce which has an information field header based on this delta-frequency minute information and a sequence number of a generated number series corresponding for every cell, An information field header separation part which separates said information field header from said received cell, A sequence number delta-frequency minute information primary detecting element which detects said sequence number and said delta-frequency minute information from said separated information field header, The sequence number Monitoring Department which supervises said detected sequence number and detects abandonment of said cell based on the continuity of said sequence number, M (M is natural number) cycle received at intervals of the constant period -- impending -- N (N is natural number) cycle received before account delta-frequency minute information and M cycle eye -- impending -- said delta-frequency minute information in said memory based on a memory which records account delta-frequency minute information, and a monitored result of said sequence number Monitoring Department, [manage and] A delta-frequency part information management forecast processing part which calculates a predicted value of said delta-frequency minute information, It has a clock reproduction part which reproduces said source clock based on said delta-frequency minute information outputted from said delta-frequency part information management forecast processing part, and said network clock, As opposed to abandonment of said cell as which said sequence number Monitoring Department detected said delta-frequency part information management forecast processing part, M (M is natural number) cycle missing by abandonment of said cell -- impending -- N (N is natural number) cycle which received correctly a predicted value of account delta-frequency minute information before said M cycle eye -- impending -- it constitutes so that it

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OPERATION

[Function]the delta-frequency minute information of N cycle eye already correctly received before M cycle eye by cell abolition instead of the delta-frequency minute information of M cycle eye which was receive-not-ready ability according to the method of claim 1, and the composition of claim 2, [use and] The predicted value of the delta-frequency minute information of M cycle eye is calculated, and a source clock is reproduced with the calculated delta-frequency minute information predicted value.

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EXAMPLE

[Example]Hereafter, the clock reproduction method of one example of this invention and the clock reproduction circuit for realizing this are explained, referring to drawings.
[0011]Drawing 1 is a block diagram of the clock reproduction circuit of this example. The ATM (Asynchronous Transfer Mode) transmission system in which abandonment of a cell generates 100 in drawing 1, The SAR header separation part as an information field header separation part which separates the SAR (SegmentationAnd Reassembly sublayer) header which is an information field header of the cell which 101 received from the ATM transmission system 100, The sequence number delta-frequency minute information primary detecting element which detects the sequence number 104 and the delta-frequency minute information 105 from the SAR header which 102 separated by the SAR header separation part 101, and the SAR header 102 which 103 separated, The sequence number Monitoring Department where 106 supervises the sequence number 104, and 107 The sequence number monitored result signal of the sequence number 104 in the sequence number Monitoring Department 106, 114 the delta-frequency minute information detected at the sequence number Monitoring Department 106 by the constant period signal to receive a delta-frequency minute information periodic signal and 108, The delta-frequency part information management forecast processing part which manages the delta-frequency minute information 105 with the sequence number monitored result signal 107, and carries out data processing of the delta-frequency minute information predicted value by the delta-frequency minute information 105, the memory which 110 records the delta-frequency minute information of M cycle eye, and the delta-frequency minute information of N cycle eye before M cycle eye with the delta-frequency part information management signal 109 outputted from the delta-frequency part information management forecast processing part 108, and is held. 111 is a clock reproduction part which reproduces the source clock 113 with the delta-frequency minute information 105 and the network clock 112.
[0012]Clock reproduction operation of the clock reproduction circuit which consists of the above components is explained below using a drawing. In drawing 1, a cell is first transmitted by the ATM transmission system 100. The SAR header 102 is separated from the received cell by the SAR header separation part 101. The SAR header 102 separated by the SAR header separation part 101 is constituted from sequence number protection which protects a sequence number, delta-frequency minute information, a sequence number, and delta-frequency minute information by the format as shown in drawing 3. A sequence number is the number series added to a chronological order of the cell in the transmitting side. The sequence number delta-frequency minute information primary detecting element 103 detects the sequence number 104 and the delta-frequency minute information 105 from the SAR header 102 separated by the SAR header separation part 101. The detected sequence number 104 is supervised by the sequence number Monitoring Department 106. The discontinuity of a sequence number detects cell abolition. The sequence number Monitoring Department 106 outputs the existence of cell abolition as the sequence number monitored result

signal 107. The delta-frequency part information management forecast processing part 108 manages the received delta-frequency minute information 105 with the sequence number monitored result signal 107.

[0013]When it is usual [which cell abolition or cell delay does not generate] here, By the delta-frequency part information management forecast processing part 108, the received delta-frequency minute information 105 is recorded instead of the oldest delta-frequency minute information currently recorded on the memory 110, and the delta-frequency minute information of M cycle eye and the delta-frequency minute information of a periodic (M-1) eye are recorded on the memory 110.

[0014]When abandonment of the cell which carried out multiplex [of the delta-frequency minute information of M cycle eye] occurs, The sequence number Monitoring Department 106 outputs the sequence number monitored result signal 107 which detected generating of cell abolition to the delta-frequency part information management forecast processing part 108, The delta-frequency part information management forecast processing part 108 calculates the predicted value of the delta-frequency minute information of M cycle eye by data processing using the delta-frequency minute information of N cycle eye received correctly before M cycle eye currently recorded on the memory 110, The calculated delta-frequency minute information predicted value is outputted to the clock reproduction part 111, and the source clock 113 is reproduced using a delta-frequency minute information predicted value in the clock reproduction part 111.

[0015]Even when cell abolition occurs in the ATM transmission system 100 by the above operation, influencing of influence in reproduction of the source clock 113 by this cell abolition can be controlled, it is stabilized and the source clock 113 can be reproduced.

[0016]Next, it explains, referring to drawings for one example of the forecast processing part in the delta-frequency part information management forecast processing part (for example, delta-frequency part information management forecast processing part 108 of the clock reproduction circuit of this example shown in drawing 1) of the clock reproduction circuit of this invention.

[0017]Drawing 2 is a block diagram of the example of the forecast processing part in a delta-frequency part information management forecast processing part (for example, delta-frequency part information management forecast processing part 108 of drawing 1). The difference calculation circuit where 200 carries out data processing of the difference value 203 of the delta-frequency minute information of the delta-frequency minute information 201 of L (L is natural number) cycle eye and the delta-frequency minute information 202 of a periodic (L+1) eye which were recorded on the memory 110 in drawing 2, The period counter in which 204 calculates the periodicity 205 of delta-frequency minute information with the delta-frequency minute information periodic signal 114, and 206, When the sequence number monitored result signal 107 receives delta-frequency minute information normally, The latch holding the periodicity 207 of N cycle eye of the periodicity 205 of delta-frequency minute information and 208, [that is,] When cell abolition occurs with the sequence number monitored result signal 107, the cycle difference arithmetic circuit which calculates the cycle difference value 209 to the cycle which cell abolition generated after receiving delta-frequency minute information normally, and 2a are the prediction arithmetic circuits which comprised the multiplication circuit 210 and the subtractor circuit 215.

data processing of the predicted value 212 of the delta-frequency minute information of missing M cycle eye is carried out using the difference value 203 of delta-frequency minute information, the delta-frequency minute information 211 of N cycle eye received normally, and the cycle difference value 209.

The delta-frequency minute information 214 which received the delta-frequency minute information 105 which outputs 213 to the clock reproduction circuit 111 with the sequence number monitored result signal 107 when a cell was received normally, When cell abolition occurs, it is a selector circuit which is chosen from the delta-frequency minute information predicted value predicted in the prediction arithmetic circuit 2a, and is outputted.

[0018]Prediction processing operation of the forecast processing part which consists of the above components is explained below using figures. In drawing 2, when delta-frequency minute information is received normally, the delta-frequency minute information 201 of L cycle eye and the delta-frequency minute information 202 of a periodic (L+1) eye are used, Data processing of the difference value 203 of the delta-frequency minute information of the delta-frequency minute information 201 of L cycle eye and the delta-frequency minute information 202 of a periodic (L+1) eye is always carried out by the difference calculation circuit 200. If fluctuation of the source clock of the transmitting side is small, this difference value 203 will turn into about 1 constant value. The delta-frequency minute information periodic signal 114 is calculated by the period counter 204, and it asks for the delta-frequency minute information periodicity 205. When delta-frequency minute information is received normally, the delta-frequency minute information periodicity 205 is held by the latch 206 using the sequence number monitored result signal 107.
[0019]As for the periodic signal 205, M cycle is shown, when it was normally received to the delta-frequency minute information of N cycle eye, and cell abolition is detected at the sequence number Monitoring Department 106 while receiving the delta-frequency minute information of M cycle eye. The periodicity 207 which received normally [the newest] shows N cycle.
The cycle difference arithmetic circuit 208 carries out data processing of the cycle difference of the periodicity 207 when delta-frequency minute information is normally received with the sequence number monitored result signal 107 and the present periodicity signal 205, and outputs the cycle difference value 209. The multiplication circuit 210 performs the multiplication of the difference value 203 of delta-frequency minute information, and the cycle difference value 209, and outputs the multiplication result 216. the subtractor circuit 215 subtracts the delta-frequency minute information 211 of N cycle eye to the multiplication result 216, and outputs this subtraction result to the clock reproduction circuit 111 via the selector circuit 213 as the predicted value 212 of the delta-frequency minute information of M cycle eye missing by cell abolition.
[0020]By being able to predict the delta-frequency minute information of M cycle eye missing by cell abolition, and outputting this delta-frequency minute information predicted value to the clock reproduction circuit 111 by the above operation, Based on this delta-frequency minute information predicted value, the clock reproduction circuit 111 can reproduce a source clock, and the effect explained in the example of drawing 1 can be acquired.
[0021]Although each of above-mentioned examples explained the ATM transmission system as an example, A network clock and the source clock of this invention are asynchronous not only at an ATM transmission system but the transmitting side, It cannot be overemphasized in other transmission systems which detect the difference information of the frequency of a network clock, and the frequency of a source clock, and transmit delta-frequency minute information at intervals of a constant period that it can apply similarly.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The block diagram of the clock reproduction circuit of the example of this invention
[Drawing 2]The block diagram of the forecast processing part of the delta-frequency part information management forecast processing part of the example
[Drawing 3]The format figure of an ATM cell
[Drawing 4]The block diagram of the conventional clock reproduction circuit
[Description of Notations]
101 SAR header separation part
103 Sequence number delta-frequency minute information primary detecting element
106 Sequence number Monitoring Department
108 Delta-frequency part information management forecast processing part
110 Memory
111 Clock reproduction part
200 Difference calculation circuit
204 Period counter
206 Latch
208 Cycle difference arithmetic circuit
210 Multiplication circuit
215 Subtractor circuit

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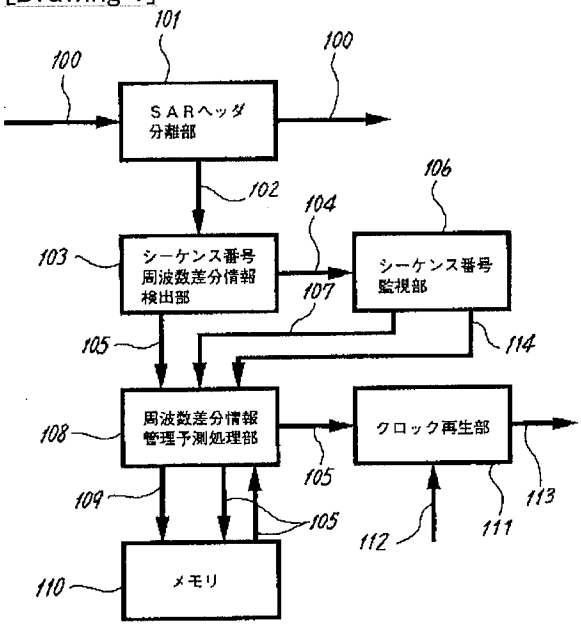
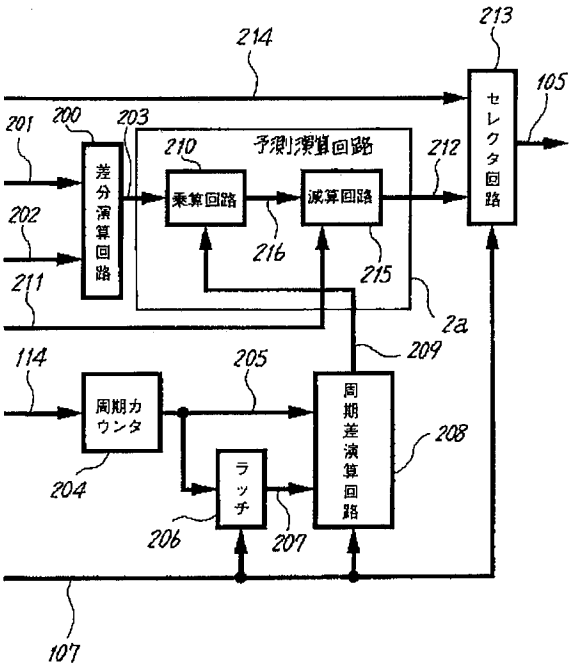
DRAWINGS

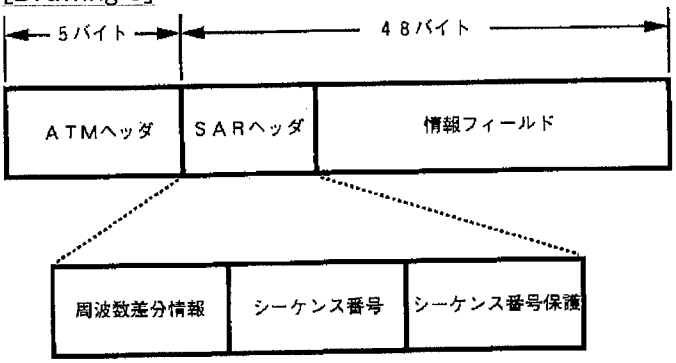
[Drawing 1]



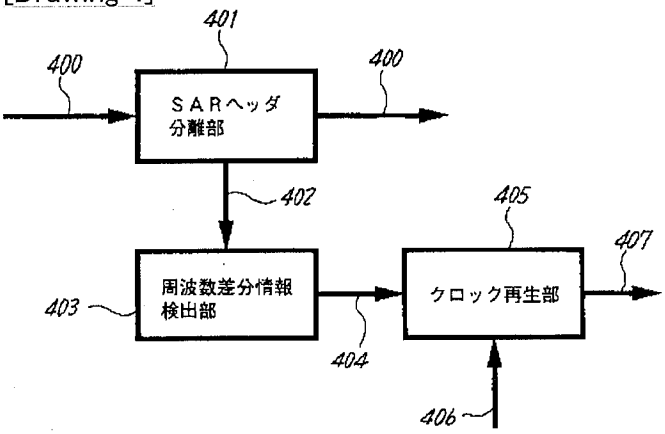
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]